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Sandra Rothenberg
Rochester Institute of Technology, slrbbu@rit.edu

Erinn G. Ryen
Wells College, eryen@wells.edu

Anne G. Sherman
Rochester Institute of Technology, annegsherman@gmail.com

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RESEARCH ARTICLE

The Evolution of Research on Sustainable Business Models: Implications for Management Scholars

Sandra Rothenberg
Rochester Institute of Technology
slrbbu@rit.edu

Erinn G. Ryen
Wells College
eryen@wells.edu

Anne Sherman
Think Impact
annegsherman@gmail.com

ABSTRACT: Business models that lead to reduced consumption of resources and energy and support a Circular Economy can help businesses address the world's pressing environmental problems. At the same time, they are concepts that have taken decades to garner serious attention in management literature. In this paper we review patterns in scholarship across a wide range of disciplines (sciences, humanities and management) on the Circular Economy and related business models like Extended Producer Responsibility, Product Service Systems, Collaborative Consumption, Sharing Economy, and Voluntary Simplicity. We find that management scholars have primarily focused on less radical business models, such as Extended Producer Responsibility (EPR), and have been slow to research more radical business models, such as Collaborative Consumption. In addition, government policies in Asia and Europe are associated with faster growth of research in these geographic regions. From this review, we discuss how business scholars might learn from these trends, and the implications for future research on business models that lower material consumption.

KEYWORDS: Circular Economy, Product Service Systems, Sharing Economy, Collaborative Consumption, Extended Producer Responsibility, Voluntary Simplicity, Consumption, Business Models

I. INTRODUCTION

As our consumption of resources, materials, and products and generation of waste continues to rise, individuals, firms, and governments are seeking ways to address concerns about resource scarcity and climate change impacts with new business and personal models of consumption. Initially, many companies began viewing environmental challenges as a compliance issue and focused on meeting minimal standards (Nidumolu et al., 2009), but current and future global challenges like resource limitations, ecological degradation, and the occurrence of more severe and frequent weather disruptions require new approaches to business (Winston, 2014). Currently, companies employ a range of strategies to meet these environmental challenges, including improving operational efficiency, pollution prevention, and developing and using innovative technologies (Nidumolu et al., 2009). These strategies primarily focus on eco-efficiency: improve a company's operational efficiency by designing green products and services that reduce energy and resource consumption, ease dependence on fossil fuel, limit waste generation, and lower costs and compliance risks (Nidumolu et al., 2009; OTA 1992).

While operational efficiency improvements reduce the environmental footprint industrial and consumer activity, they do not address reduced material consumption, something that some see as essential for sustainability (Nicol & Thompson, 2007). In fact, as industry increases eco-efficiency, it may encourage increased consumption, commonly known as the rebound effect (Berkhout & Hertin, 2004). As one example, improved computational efficiencies, reduced prices, and increased active use of consumer electronics over time has led to the rebound effect by stimulating increased demand for devices and increased energy consumption (Berkhout & Hertin, 2004; Ryen, Babbitt, & Williams, 2015). This rebound effect has also been seen at the industry scale as well (Dahmus, 2014). Thus, without a systematic approach to address resource and climate change challenges that includes reduced consumption in at least developed nations, significant losses will continue to occur along the supply chain (EMF, 2013).

To move beyond eco-efficiency, some companies are rethinking their business models and practices to reduce consumption and share resources (Mont 2002; EMF, 2013). By challenging basic assumptions about customer needs and economic growth, collaborating with a variety of stakeholders, and developing new sustainable product designs and services, companies can be positioned to grow while also meeting the changing demands and expectations of customers with business models that reduce consumption (Winston, 2014; Nidumolu et al., 2009). Adoptions of these business models require an understanding of how the models enhance value creation (Abdelkafi and Hansen, 2018).

The Circular Economy sits within a larger range of business models and concepts that reduce material consumption (Botsman, 2013). Models range from traditional, firm-driven models of Extended Producer Responsibility (EPR), to ones that replace products with a mix of goods and services, to models based on the sharing of material goods. Some models, like EPR, require new relationships up and down the supply chain. The latter models require a shift in the traditional economic relationship between the consumer and a firm, from product manufacturing and personal ownership of goods towards a 'Sharing Economy,' in which the firm or consumer provides services and/or shares goods with other consumers (Hu et al., 2012; Tan et al., 2010; Puschman & Alt 2016).

In this paper, we are interested in the extent to which academic disciplines have been involved with the emergence of scholarly research related to the Circular Economy and related business concepts. As noted by Nohria & Eccles (1998, 283), "Critics of business school research charge that it places academic rigor over managerial relevance, and that it fails to take the kind of interdisciplinary approach that is necessary for addressing practical problems in the real world." We would add that research needs to be socially relevant as well. The growing global problems with waste, climate change, and other sustainability issues suggests that management scholars are failing at this task. The Circular Economy is one solution to these problems, but it is a concept that has been around since the late 1960s (Boulding, 1966) and has taken decades to be addressed into mainstream management literature (EMF, 2013).

There have been prior attempts to take a wider view of the research on low consumption business models, but the articles are primarily focused on one type of model (Product Service Systems, or PSS, for example) (Baines, Lightfoot, Evans, et al., 2007; Baines, Lightfoot, Benedettini et al., 2009; Taticchi et al., 2013; Sakao et al., 2009; Lightfoot et al., 2013; Reim et al., 2015; Tukker, 2015). A holistic perspective is explored in a recent literature review synthesizing the interconnections between the Internet of Things (IoT) sector,

Circular Economy, and PSS model, noting the need for further cross sectional and longitudinal research between concepts (Alcayaga et al. 2019).

Most of these studies focus primarily on management disciplines (Lightfoot et al., 2013; Taticchi et al., 2015; Reim et al., 2015; Tukker, 2015). Several of these reviews, however, do call for a broader review of the research on sustainable business models. Lightfoot et al. (2013), for example, recognizes their review's weak linkage to the engineering and science research community, in that 90% of the literature they review are dominated by the broader management field. They state that there is value provided in understanding how different research communities view the topic of servitization. Bocken et al. (2014) also conduct a broad literature review on sustainable business models and categorize them into eight business 'archetypes' in an attempt to bring together the "silos of literature" (p. 55, 2014).

In this paper, we cast a wide net to review the literature over an 11-year span across business, science, and humanities disciplines. Using a rigorous and structured search of the literature, we look at patterns within each discipline in terms of areas of research focus and geographic location. While we look across multiple disciplines, we focus more closely at research in business related disciplines. In the 70s and 80s, the management scholars saw the emergence of pollution prevention as a means to address environmental concerns (Royston, 1980). Management scholars focused on convincing practitioners "pollution prevention pays" and studied how to best achieve pollution prevention goals. It is unclear that, even with the emergence of new business models, management scholars have been as quick to conduct research on more radical models of business that challenge consumer (rather than firm) consumption head on.

We start by defining the range of different business models and concepts, organized along a spectrum of the changing nature of the consumer/firm or consumer/consumer relationship, and explain how these categories drove our choice of search terms. Then we present our methodology. The final section analyzes the literature and discusses the themes associated with each search term. We conclude with thoughts about how we might learn from these trends as new business models emerge, and the implications for future research in the area of the Circular Economy.

II. BUSINESS MODELS IN THE CIRCULAR ECONOMY

In this section, we will review the concept of the Circular Economy, as well as a number of related concepts, including Extended Producer Responsibility (EPR), Product Service Systems (PSS), Collaborative Consumption, Sharing Economy, and Voluntary Simplicity. We then provide a framework (Figure 1) to show how these concepts are related.

Circular Economy

The concept of transforming our wasteful, linear systems into a 'Circular Economy' has been popularized with the launching of the Ellen MacArthur Foundation (EMF) in 2010 and its mission to accelerate this transition. Similar to the concept of sustainability, a criticism of the issue in operationalizing a Circular Economy concept has been the lack of clear definition or understanding (see Kirchherr et al. (2017) for its analysis on 114 definitions). The concept of a Circular Economy stems from multiple disciplines (see overview in Ghisellini et al. 2016 and Zink & Geyer 2017); it aims to resemble the restorative and regenerative attributes of a natural, sustainable system, and is intentionally designed to eliminate waste, save virgin materials, optimize the flow of products, materials, and components at their highest value, yielding both economic and environmental benefits (EMF, 2019; Stahel, 2013, 2016).

A changing attitude about consumption was originally noted by Kenneth Boulding (1966). Boulding (1966) described a 'closed' system (in comparison to the existing open or 'cowboy economy') that minimized throughput of materials and energy and maintained a stock, rather than increasing the extraction, consumption, and production of virgin materials. The economic concept of a Circular Economy was furthered by Stahel (1982), who recommended a 'spiral loop' that minimized the flow of matter, energy, and negative impact on the environment environmental deterioration without impinging growth and progress.

The EMF concept of a Circular Economy has both biological and technical principles. On the technical side of the Circular Economy, there are several principles that recognize the critical roles of the users versus the service and OEM providers (EMF; 2019) and yield varied environmental benefits of 'eco-sufficiency' to 'eco-efficiency' (Ghisellini et al., 2016; Figge et al., 2014). While the literature discusses a number of principles (Stahel, 2016; Ghisellini et al., 2016; Kirchherr et al., 2017; Alcayaga et al, 2019; EMF 2019), we focus on five (Reduction, Repair, Reuse, Remanufacturing, Recycling).

Extended Producer Responsibility

Extended Producer Responsibility (EPR) is a common business and governmental strategy to decrease the total environmental impact of a product by making the manufacturer responsible for the entire life cycle of the product (Lindhqvist, 1992; Sachs, 2006; Nicol & Thompson, 2007). EPR activities may include increasing product durability, increased service agreements, maintenance, repair, and product take back with reuse and recycling (Roy, 2000). EPR is seen as an extension of product liability law (Sachs, 2006) and often refers to 'product take back' (Nakajima & Vanderburg, 2005). Early policies began with bottle bills (Nakajima & Vanderburg, 2005), but more recently expanded to electronics, vehicles, and packaging materials (Sachs, 2006). OECD (2001) originally defined EPR as having two key elements: 1) physical or economic and full or partial responsibility of the product and 2) providing incentives to encourage environmentally friendly designs to reduce waste generation (OECD, 2001). Thus, EPR seeks to make improvements both upstream and downstream with improved product design and end-of-life management systems (Manomaivibool & Hong, 2014).

Ideally, a producer should be well positioned to be responsible for its products' waste management because the company, rather than the consumer, has the information and ability to control the design and production process (Nicol & Thompson, 2007). Producers can design products to extend their lifespans by using more durable materials, design products that use less material, more efficiently use resources, or enable the efficient recovery of materials at end of life (Ehrenfeld & Gertler, 1997; Fiskel, 2009; Telenko, Sosa, & Wood, 2016).

Product Service Systems

Product Service System (PSS) center on the concept of servitization of manufacturing, as coined by Vandermerwe & Rada (1988), and involves shifting from solely selling products to the provisioning of products and services (Sakao et al., 2009). Most definitions of PSS focus on consumers paying for access to the services in combination with ownership of product or in the replacement of participation product (Beuren et al., 2013; Lindhqvist, 2003; Botsman & Rogers, 2011). PSS models seek to provide a mix of physical and functional goods, as well as services, support and knowledge that is focused on the customer and adds value to an OEM's primary offerings (Baines et al., 2009).

It is important to note that PSS is a term also used for the general move to services in industry, and thus does not necessarily lead to reduced consumption or environmental improvement. For example, in a literature review of PSS, Beuren et al. (2013) outline six common definitions of PSS, two of which make no mention of the environmental impact. Similarly, in a review of PSS across business, engineering and information systems, Boehm & Thomas (2013) found that only a small percentage of the articles focused on sustainability. PSS, however, has the potential to lower environmental impacts by separating economic activities from consuming resources (Mont, 2002; Sakao et al., 2009), and there has been growing focus on PSS in industry as a means to meet demands for reduced consumption of products and materials for both the OEM and the customer (Rothenberg, 2007).

PSS models that purposely reduce material consumption can be broken down into two categories: leasing and servicizing. For leasing, the defining characteristics are a length of ownership defined over several years, no sharing of the utility provided by the product over the course of the lease, limited number of turnovers, and higher investment costs. Key in this arrangement is that the "seller typically takes responsibility for supplying, maintaining, taking back and recycling all physical aspects of the system." (Roy, 2000 p. 293). Leasing is becoming a more appealing option rather than selling products or implementing EPR strategies because it provides environmental benefits of closing the gaps in material and resource loops, and extends a product's lifespan (Qian & Burritt, 2011). As in the case of solar power systems, leasing can also reduce barriers to adoption of new technology (Shih & Chou, 2011).

The second type of PSS is "servicizing," a term coined by White et al., (1999), in which companies offer a mix of products and services that are specifically aimed to reduce material consumption and environmental impact. An example of servicizing is how a paint company, PPG, sells car manufacturers environmentally friendly paints, but also paint system management services on site to help their customers use less of these paints (Rothenberg, 2007). Companies, of course, may have a mix of these types of services. Xerox Global Services is an example of a company implementing a multifaceted PSS model (leasing and servicizing); they refocused its printing services on improving office efficiency and leasing printers to its customers rather than solely selling printers (Rothenberg, 2007).

Collaborative Consumption and Sharing Economies

Another type of business model that often overlaps with PSS is based on the concept of sharing (giving and receiving of) or exchanging new, used, or pre-owned goods and services, rather than private ownership (Belk, 2007; Puschman & Alt, 2016). This concept is often referred to as a Sharing Economy (Puschman & Alt, 2016), as well as Collaborative Consumption (da Silva et al., 2014; Piscicelli et al., 2015). Examples include renting, gifting, bartering, swapping, allocation of resources, authorized use of public resources, lending, and borrowing (Botsman & Roger, 2011; Belk, 2007). For example, the traditional car-leasing model has evolved more recently with the advent of the Internet, serving as an important platform for companies around the world like Car2go®, Drivenow®, Sharoo®, Getaround®, and Relayrides ® to enable consumers to share vehicles (Puschman & Alt, 2016). Collaborative Consumption and Sharing models also encourage social innovation and connected communities due to the use of networks and interactions between individuals (Piscicelli, et al., 2015).

These models require the facilitation of the exchanges by either the consumer(s) or firm. The innovation and adoption of information technology and development of platforms have enabled new forms of

sharing by facilitating interaction, access to information, exchanges of information, and collaboration (da Silva et al., 2014). In *firm-aided models*, platform firms manage services that allow for the shared use of a product, so the relationship between the firm and consumer is highly interactive, but the firm is still responsible for the products/services. In some cases, this might result in access to utility or service in lieu of ownership of the product. Examples of firm-aided models include Zipcar®, Netflix®, second hand clothing stores, or bike sharing (da Silva et al., 2014), as well as traditional models like hotels and car rentals. *Customer-aided* models (also known as peer to peer) include the exchange or shared use of new or used or pre-owned goods (Piscicelli et al., 2015). This is often facilitated by an information technology network or platform, but unlike firm-aided models, ownership of the product does not reside with the network provider (da Silva et al., 2014; Piscicelli et al., 2015).

Voluntary Simplicity

While not explicitly a business model, it is important to capture the movement on the part of consumers to disengage from the OEM-customer relationship, and in the United States this behavior is often referred to as Voluntary Simplicity. Voluntary simplicity is a lifestyle that recognizes personal happiness and environmentally responsible behavior are complementary rather than a trade-off (Brown & Kasser, 2005). In other words, we can be happy consuming less and living in an ecologically sustainable manner (Brown & Kasser, 2005; Jackson, 2005). Individuals and communities who participate in these types of lifestyles make deliberate choices to limit or reduce the purchase of material goods and services in order to focus on other non-material needs (Shama, 1988; Leonard-Barton Rogers, 1979; Etzioni, 1998). An example of Voluntary Simplicity is the combination of decisions by an individual to become energy independent or self-sufficient by growing one's own food, and modifying consumption by reducing and reusing existing products and materials (Shaw & Moraes, 2009). Consumers have less engagement with the OEMs while practicing Voluntary Simplicity, but retain a high degree of decision-making power in their consumption choices.

Relationships Among Concepts

The above categories include multiple concepts and business models, some of which overlap. These models, however, do differ in some important ways. For example, while some low consumption business models significantly challenge the traditional business model and the organizational forms that support it (Davis, 2016), others are much less revolutionary. When considering how to organize these concepts, we kept returning to the OEM-consumer relationship. Thus, we organized the models along a spectrum that centered on the nature of the relationship between the customer and original equipment manufacturer (OEM). At one end was EPR, which required minimal change in the OEM-consumer relationship. At the other end was Voluntary Simplicity, which severs this relationship. Figure 1 illustrates this spectrum of business models, and represents how principles of the Circular Economy are interconnected with the business models of EPR, PSS, Collaborative Consumption/Sharing, and Voluntary Simplicity.

III. METHODS

The scope of our analysis was an 11-year period from 2004 to 2015. As seen later in the paper, this sample period represented a range broad enough to show the early evolution of research in this area, ending on the first year when the search showed a large increase in coverage of the concepts in academic journals. Using the categories discussed above, we developed a number of search terms and conducted full text searches in six databases that crossed the humanities, business, and engineering/science dis-

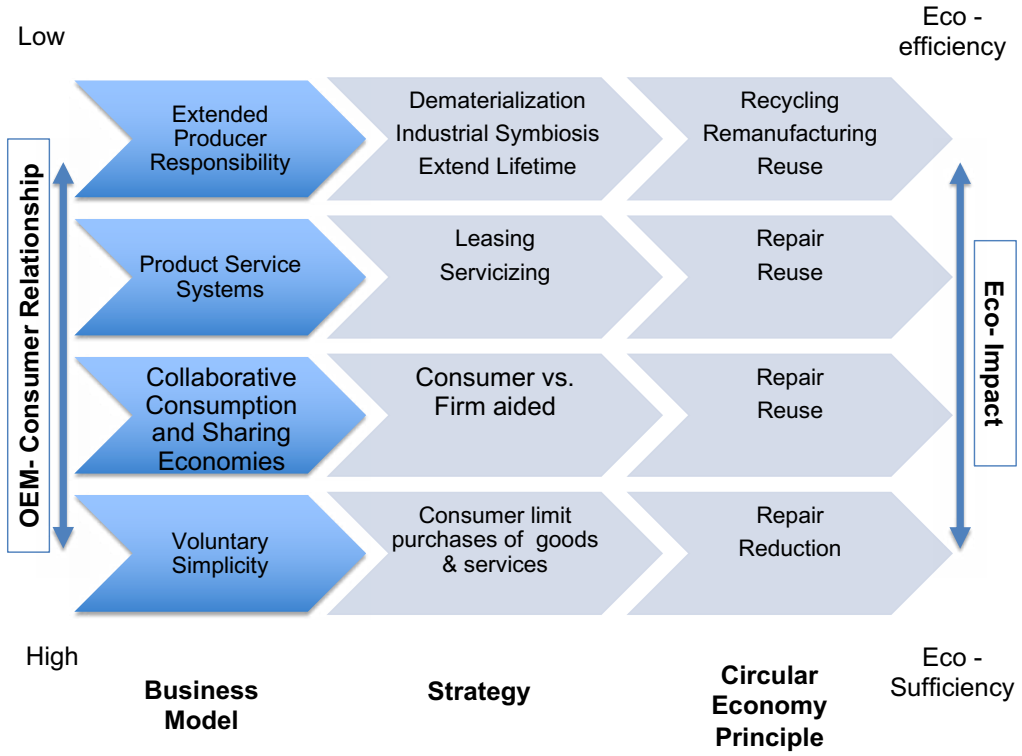

Fig.1 Framework for Circular Economy Concepts

ciplines: EBSCO, Emerald, JStor, ProQuest, Sage, and Science Direct. These databases were selected to ensure that the broadest range of journals were selected, and to ensure coverage across all disciplines relevant to our line of inquiry.

Our search started using the five terms listed in Figure 1. Upon review of the results, we found that a large number of the "Product Service System" results had no connection to environmental outcomes or reduced material consumption. Refining our search, we created three separate search terms by adding modifiers "environmental management", "sustainable development", and "environmental impact" to the "Product Service System." The final research terms used were: "Circular Economy," "Voluntary Simplicity," "Collaborative Consumption," "Extended Producer Responsibility," "Sharing Economy," "Product Service Systems & Sustainable Development," Product Service Systems" & "Environmental Impact," and "Product Service Systems" & "Environmental Management."

From this point, results were further refined several times by two researchers who reviewed the abstracts and agreed to remove duplicates, irrelevant articles (i.e. book reviews, conference proceedings, table of contents, and editorials), foreign language articles, and incomplete entries that could not be completed. After this, abstracts were reviewed to determine if the articles were related to the topics in question. This was done separately by two researchers, who then compared results and discussed the articles for removal. After the screening process, a total of 1,494 articles remained from our initial search.

Next, each of the abstracts were read and the articles were coded by search term and geographic region, and journal type. It was possible for an article to be coded under more than one search term (i.e. if it came up in different searches), but only one geographic region and journal type. For geographic region, the research in each article was identified as being conducted in one of the following regions: Europe, Asia, North America, South America, Australia and Oceania, Middle East, North Africa, and Greater Arabia, Sub-Saharan Africa, and Caribbean. In addition, articles that did not identify a geographic region were coded as 'Not Specific' and articles that involved research that was in multiple regions were coded as 'Multi." Again, two researchers analyzed each abstract (and when needed, the article itself) independently and any differences in coding were discussed and resolved.

For journal type, we started by identifying a total of 12 journal types, which were further organized into three academic disciplines (business, sciences, and humanities and liberal arts), repeating the same process as described above for geographic region, we coded the journals in one of these twelve categories. See Table 1 below for details of the journal types.

Lastly, to get a feel for the types of activities being examined in the research, we conducted a simple word count on the sample, focusing on the different activities of the Circular Economy framework, including recycle/ing, reduce, recover, reuse, remanufacture/ing, repair, and borrow.

Table 1. Description of academic discipline and journal focus

Academic discipline	Journal focus
Business	• Accounting and finance management
	• Management (including organizational behavior organizational strategy, human resource management, and international relations)
	• Innovation and strategy
	• Management information systems (MIS) and knowledge management
	• Marketing and communications
	• Operations management (including operations research, management, management science, and production and operations manufacturing)
	• Environmental, ethical, and CSR focused business journals
Sciences	• Engineering and computing
	• Energy, environmental science, & other science
Humanities and Liberal Arts	• Sociology, ethnography, and psychology
	• Policy and economics
	• Other social sciences

IV. RESULTS

General Overview

Over a period of eleven years, we have seen a significant growth in research on the concepts related to the Circular Economy. Figure 2 shows the growth of publications over time for each of the search terms. We also point to some impactful events during this time period that we will return to in the discussion. The total number of articles in our search increases 29-fold, with 18 in 2004 to 529 in 2015. As shown in Figure 2, articles in 2004 are primary focused on Voluntary Simplicity, with nearly half (44%) associated with this search term (8 articles). However, by 2015, the Circular Economy is the most common focus by far (51%), followed by EPR (19%) and Sharing Economy (16%). 2015 is also when you see a sharp increase in research on all concepts, a trend that continues in 2016. Thus, we felt that 2015 was a good year to stop, given our focus on the emergence of research in the field.

As discussed earlier, there are a range of activities related to the different business models. We conducted a simple word search for a range of activities in order to see what aspects of behavior the scholars were focusing on. We found that the term "recycle/ing" occured 494 times in the data set, "recover" was found 153 times, the word "reuse" was found 104 times, and "remanufacture/ing was found 93 times. Meanwhile, the term "repair" was found only 14 times and the term "borrow" was found only 3 times.

These terms did not always have similar meanings across papers. Repair was mostly related to the electronics industry as a way to reduce waste generation and extend product lifespan/reuse opportunities

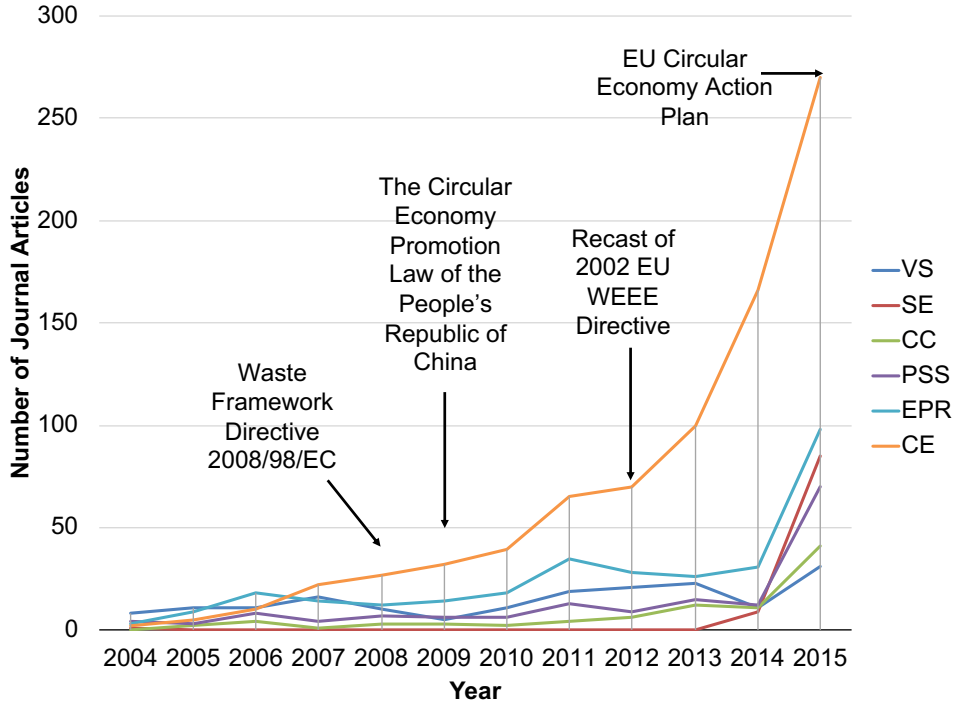

Fig .2: Number of journal articles per search term from 2004 to 2015.

Table 2. Number of journal articles per region per year

	Asia	Middle East, North Africa, and Greater Arabia	Europe	North America	Central and Caribbean	South America	Sub-Saharan Africa	Australia and Oceania	Cross Region	Not Region Specific
2004	2	0	4	3	0	0	0	0	3	6
2005	3	1	5	6	0	0	0	2	4	5
2006	11	0	11	7	0	0	0	0	5	11
2007	21	1	6	6	0	0	1	0	6	14
2008	27	0	9	4	0	0	1	0	4	10
2009	22	1	11	4	0	4	0	3	2	9
2010	32	0	5	3	0	0	3	3	8	13
2011	55	2	23	8	0	1	0	0	11	29
2012	55	1	21	14	0	1	1	2	8	24
2013	59	2	21	10	0	2	2	3	13	52
2014	104	4	41	8	0	2	0	4	9	51
2015	132	6	124	32	1	12	2	7	38	175

(e.g., King et al., 2006; Ladou & Lovegrove, 2008). One article, however, had a different focus and analyzes a new social enterprise in Europe that uses repair and reuse services to expand economic opportunities for the labor force (Puente et al., 2015). The terms 'recycl/recycling' is typically used in articles discussing strategies to reduce impacts from the generation of e-waste or the electronic industry. A smaller number of papers, however, look at other areas of recycling such as vehicle recycling (Tao, 2012; Zhao & Chen, 2011), construction and demolition waste (Yuan et al., 2011), the rubber glove industry (Rattanapan et al., 2012), overall industrial recycling networks (Strebel & Posch, 2004), and recycling of municipal solid waste in developing countries (Xue et al., 2011). One paper focused on the limits of recycling as a waste strategy and argued for other strategies and models to address consumption (Short, 2004).

Region Overview

As shown in Table 2, many of the articles were not region specific, such as those that were theoretical in nature, involved basic science, or involved models and simulations. For those articles that were region specific, the articles are initially focused on research in Europe and North America (U.S. and Canada). By 2015, we see research conducted in all regions, as well as multi- or cross region comparisons, but research conducted in Europe and Asia (China was the most common country for Asia) appear to dominate the search results (23% and 25%, respectively).

Looking specifically at each of the search terms, found in Table 3, we see that studies on PSS are most often not region specific. This reflects the high number of simulation or modeling based papers on this topic. Applied research was focused largely in Europe. The majority of articles on Voluntary Simplicity were based in North America and Europe (50

Table 3. Cross tab of search terms and regions

	Voluntary Simplicity	Sharing Economy	Collaborative Consumption	Product Service Systems	Extended Producer Responsibility	Circular Economy
Asia	8	4	8	11	89	421
Middle East, North Africa, and Greater Arabia	6	1	0	0	7	5
Europe	27	18	23	50	70	124
North America	50	18	13	4	20	19
Central and Caribbean	0	1	0	0	0	0
South America	5	1	1	1	7	9
Sub-Saharan Africa	0	0	1	1	8	0
Australia and Oceania	10	1	5	1	1	10
Cross Region Comparison	19	9	9	15	42	33
Not Region Specific	52	42	29	74	62	187

and 27 articles, respectively). Asia and Europe were the major locations of empirical studies on Circular Economy and EPR related research, with 89 and 421 articles focusing specifically on EPR and Circular Economy, respectively, in the Asian region and 70 and 124 articles on EPR and Circular Economy, respectively, in Europe (Table 3).

Disciplines

We coded journals into a number of disciplines. As seen in Figure 3, the earlier stages of research on this topic was dominated by humanities-related journals, such as sociology, psychology, economics, and policy, comprising 78% of the articles in 2004. By 2015, the spread of articles appears more evenly distributed among the three different academic domains (business, humanities, and sciences) (Figure 4). Figure 4 also reflects the larger presence of EPR and Circular Economy research in science and the greater engagement of the humanities in Voluntary Simplicity and Sharing Economy scholarship.

For the non-business disciplines (Table 4), science journals were heavily weighted towards Circular Economy and EPR (340 and 139 articles). Within science, there was a concentration of Circular Economy articles in the energy, environmental science, and other science categories. There was a small showing in computing and engineering, which perhaps reflects a growing need for new information technology platforms for the delivery of business models associated with the Circular Economy. For journals in the humanities, a high concentration of articles related to Circular Economy were in policy and economics journals. The next highest concentration of research focused on Voluntary Simplicity in sociology, ethnography, and psychology (62 in total).

Within the business disciplines, research concentrated in operations research journals, particularly in the area of EPR and PSS, while articles on Voluntary Simplicity research were found more often in marketing related journals. Sharing Economy and Collaborative Consumption research is found in general management, operations, and marketing and communication journals (see Table 5).

When looking across business journal type, 35 percent of the total number of articles in the business discipline were in management journals that specifically focused on environmental, ethical or corporate social responsibility (CSR) issues. The next highest category was operations management, which comprised 31% of the business articles. Marketing was 14% of the business articles, with general management at 10%. It is also important to note that, of the 471 articles from business journals, only 15 were from journals from the *Financial Times* Top 50 (See Table 6), a list that is commonly considered the top management journals across a number of fields (Ormans, 2016). Of these, 10 were from the *Journal of Business Ethics* (JBE). Outside of JBE, no articles from other journals in the Financial Times list appeared until 2015.

V. DISCUSSION AND CONCLUSION

The goal of this literature review was to gain a better understanding of how a wide range of different disciplines engaged in research on the Circular Economy, and related concepts, during the initial growth of the terms. Voluntary Simplicity was one of the most popular topics in 2004 and the least popular concept in 2015. Articles specifically addressing the sharing economy were non-existent until 2014 and had a large increase in 2015, suggesting that this research is in its early stages. The related term of Collaborative Consumption had a small showing

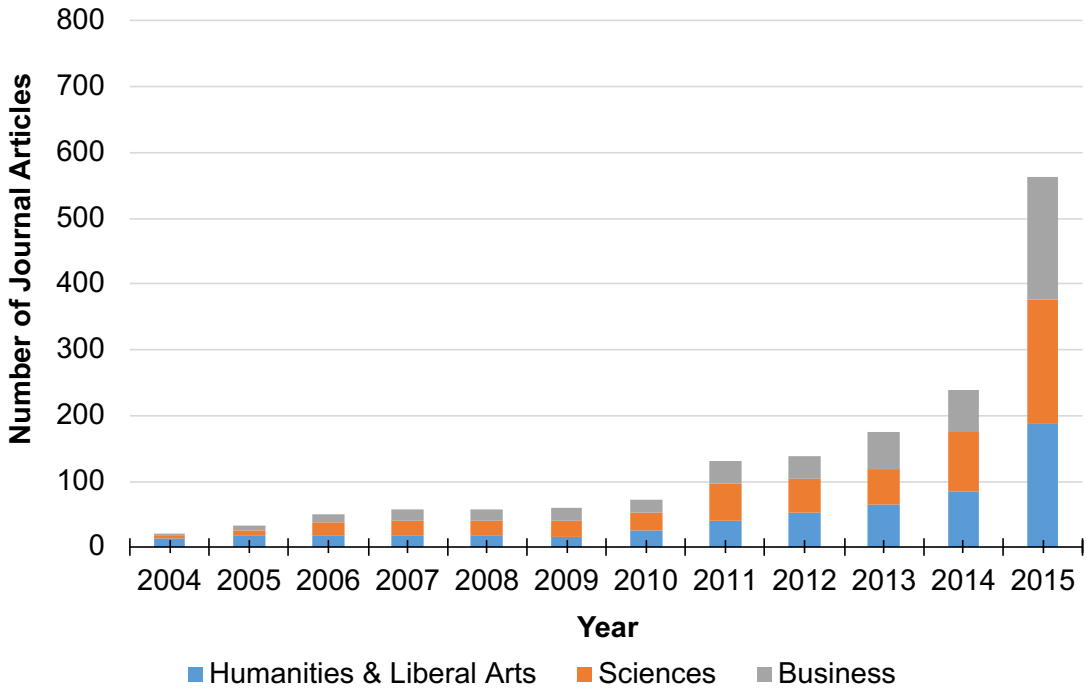

Fig. 3: Number of journal articles per academic discipline from 2004 to 2015.

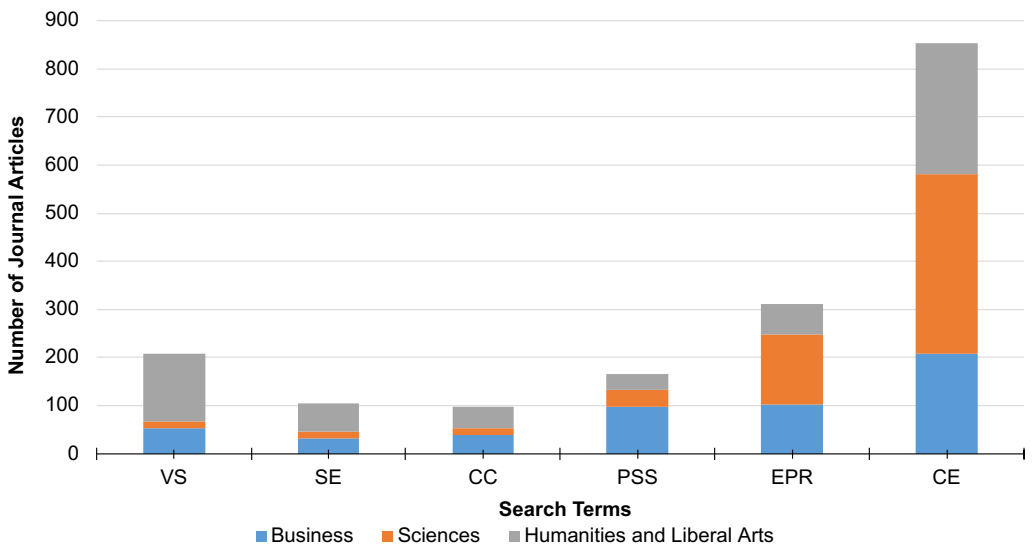

Fig. 4: Number of journal articles per academic discipline and search term

Table 4. Cross tab of search terms with the sciences and humanities literature

	Voluntary Simplicity	Sharing Economy	Collaborative Consumption	Product Service Systems	Extended Producer Responsibility	Circular Economy
Humanities/Liberal Arts						
Policy and Economics	26	21	14	10	45	128
Sociology, Ethnography, and Psychology	62	13	13	10	5	49
Other Social Sciences	52	25	18	15	12	96
Sciences						
Engineering and Computing	1	5	1	7	7	32
Energy, Environmental Science, and Other Science	12	10	13	27	139	340

that increased slightly in 2013, and then increased again in 2015, although not to the extent of the term Sharing Economy. Starting in 2007, the Circular Economy became the most common term, with a sharp increase in 2010 and then again in 2012.

In 2004, most country specific research was conducted in North America or Europe. However, by 2007, China became the largest specific country for the research, with a focus on the Circular Economy and EPR. It is not clear if this is part of a trend or just an anomaly. Also of note is the relatively consistent significant percentage of articles that are not country specific, which most often means that they are either theory or model based.

Looking across disciplines, more articles on the Sharing Economy and Voluntary Simplicity were from the humanities than from business or science. The sciences dominated research on EPR and the Circular Economy. Business had more articles than either science or humanities for PSS.

Limitations

There are a number of limitations in this study, perhaps the largest of which is that we traded depth for breadth in our study. By expanding the scope of this review, we ended up with an initial search of thousands. Even after a careful culling process, the sample was 1,494 articles. While this was useful in tracking the path of this literature over time across multiple disciplines, it made in-depth analysis of particular subjects challenging.

We were also limited by our choice in terminology. First, some our search terms (like Voluntary Simplicity) are certainly more common in North America. In fact, when presenting this research in Scandinavia, most of the audience had not even

Table 5. Number of journal articles per management discipline and search term

	Voluntary Simplicity	Sharing Economy	Collaborative Consumption	Product Service Systems	Extended Producer Responsibility	Circular Economy
Accounting and Finance	3	4	0	0	3	3
Management	7	7	8	7	11	18
Innovation and Strategy	1	6	0	1	3	8
Environmental, Ethics and CSR	2	1	3	8	21	140
MIS and Knowledge Management	0	3	0	5	3	5
Operations Management	2	5	10	72	57	29
Marketing and Communication	39	6	19	5	5	6

Table 6. Financial Times top 50 business journals (Ormans, 2016) and frequency in research results (in bold)

Rank	Journal Name	Frequency	Rank	Journal Name	Frequency
1	Academy of Management Journal	0	26	Journal of Management Studies	0
2	Academy of Management Review	0	27	Journal of Marketing	0
3	Accounting Organizations and Society	0	28	Journal of Marketing Research	0
4	Administrative Science Quarterly	0	**29**	**Journal of Operations Management**	**1**
5	American Economic Review	0	30	Journal of Political Economy	0
6	Contemporary Accounting Research	0	**31**	**Journal of the Academy of Marketing Science**	**1**
7	Econometrica	0	32	Management Science	0
8	Entrepreneurship Theory and Practice	0	33	Manufacturing and Service Operations Mgmt.	0
9	Harvard Business Review	0	34	Marketing Science	0
10	Human Relations	0	35	MIS Quarterly	0
11	Human Resource Management	0	36	Operations Research	0
12	Information Systems Research	0	37	Organization Science	0
13	Journal of Accounting and Economics	0	38	Organization Studies	0
14	Journal of Accounting Research	0	39	Org. Behavior and Human Decision Processes	0
15	Journal of Applied Psychology	0	40	Production and Operations Management	0
16	**Journal of Business Ethics**	**10**	41	Quarterly Journal of Economics	0
17	Journal of Business Venturing	0	42	Research Policy	0
18	**Journal of Consumer Psychology**	**1**	43	Review of Accounting Studies	0
19	**Journal of Consumer Research**	**1**	44	Review of Economic Studies	0
20	Journal of Finance	0	45	Review of Finance	0
21	Journal of Financial and Quantitative Anal.	0	46	Review of Financial Studies	0
22	Journal of Financial Economics	0	47	Sloan Management Review	0
23	Journal of International Business Studies	0	48	Strategic Entrepreneurship Journal	0
24	Journal of Management	0	49	Strategic Management Journal	0
25	**Journal of Mgmt. Information Systems**	**1**	50	The Accounting Review	0

heard of the term Voluntary Simplicity. We also left out related search terms, such as "service logic," "platform firms," and others, which were not specific to sustainability. Thus, it is possible that there is more engagement with topics pertinent to the Circular Economy business research, but they are talked about using terms not captured in this study.

Lastly, most of the content was gleaned from abstracts. While these abstracts often provided relevant information, they were often lacking in critical information (i.e. methods, findings, etc.) and only provided a small glimpse into the details of the study. Some articles, such as literature reviews, were downloaded and read in depth, but many were not. Again, this was a tradeoff we made for more breadth in the search.

Implications for Business Research

There are a number of lessons we can take from this analysis. First, this pattern shows the importance of "specialty" journals in business. A large portion of the business articles were from journals that specifically focused on environmental, ethical and related issues in business. While these journals are often not considered "top" journals (e.g., *Academy of Management Journal*, #1 journal on the *Financial Times* listing), they seem to be where scholars can publish research on emerging or non-conventional business topics. What was perhaps more surprising was how long it has taken for these ideas to become more "mainstream". As of 2015, there was still minimal coverage of Circular Economy concepts in top journals, such as those listed in the *Financial Times* Top 50.

There were two business subfields that did seem to embrace some aspects of the Circular Economy earlier than others. The first is operations management, whose methods and areas of focus, such as supply chains, were a natural fit with EPR and PSS. The other was marketing, where there was more coverage of both Voluntary Simplicity, and Collaborative Consumption, from marketing journals, as (perhaps ironically) marketing professionals are trying to better understand those consumers who are trying to disengage from the market, as well as how to develop brands in a collaborative marketplace.

These findings also suggest that, as with business itself, academics may have trouble shifting gears to think about radical changes in business models. The limited research in the business journals on Collaborative Consumption and Sharing Economies may be because these models require a significant change from the traditional business models (Davis, 2016) and until recently there has been less interest on the part of established firms to pursue these strategies. One exception would be Internet Technology (IT) companies, which see the Sharing Economy as a significant business opportunity; this may be why we saw a focus on the role of IT in the Collaborative Consumption in the existing literature.

Further supporting this idea is that many of the high-profile firms in the Sharing Economy are new entrants, such as Airbnb® or Uber®, which were common subjects of the research. Collaborative business models also provide new opportunities for small to medium size businesses that are experiencing challenging economic circumstances (Olaru & Vincini, 2014). Thus, it was particularly striking that there was only one entrepreneurship journal in our sample (Pisano et al., 2015) and only a few more articles that talked about the role of start-ups and/or family firms.

These findings suggest that there is a significant opportunity for those in the business field to apply their skills and tools to better understand the Circular Economy. In particular, while much of the research focuses on reuse and recycling, much less is focused on the aspects of the Circular Economy that would require behavior change on the part of the consumer. Of the studies that do focus on computers, many of them focus on energy use and recycling of household waste. Early research on models that call for radical changes in consumer consumption patterns focused on defining what the Sharing Economy is, describing current examples, and understanding the motivations behind consumer and firm participation in this new business model.

There are opportunities for scholars of the Sharing Economy and Collaborative Consumption to learn from the research on EPR and PSS models. As shown with the transportation industry, many initiatives failed to integrate and connect the key components of PSS in a holistic system and were therefore unable to achieve the potential benefits (Williams, 2007). Thus, Sharing and Collaborative models need to provide a clear understanding of the processes involved, need for organizational change, and overall integration with the business model (Marques et al., 2014).

While the Circular Economy model holds promise from a sustainability perspective, the literature, primarily in humanities and sciences, is just starting to look at the actual social and environmental implications of these models. There are also significant gaps in our knowledge regarding the organizational and human resource challenges in the Circular Economy. While six of the articles dealt with labor issues, they were published in law and humanities journals. A few articles looked at management challenges and strategies, but were primarily focused on PSS business models (Reim et al., 2015).

Geographically, the empirical research focused largely on Europe, Asia, and to a lesser extent, North America. For many developing countries, the focus of concern, and the focus of research was on the management of waste, much of which was transferred from developed countries. The challenges of "reduced consumption" is simply not a relevant question for some of these regions (Arnould, 2007). However, it may be in these less developed markets, where financial and other resources are scarcer, that collaborative economic systems would have the most market potential, and help economic development in those regions.

This research also points to the importance of public policy. The dominance of empirical research in Asia and Europe is likely influenced by government policies focused on EPR and circular economies (Lieder & Rashid, 2016). Europe, for example, passed legislation focused on EPR in 2002 (Waste Electrical Electronic Equipment, WEEE (Directive 2002/96/EC), which was revised in 2012 (Directive 2012/19/EU) (EC 2019). In 2008, Europe promulgated a new waste framework, Directive 2008/98/EC, which included both EPR and a path towards developing Circular Economy policies (EC 2019). In 2015, Europe passed a new "Circular Economy Action Plan in 2015 Package" (European Commission 2015). China's Circular Economy policy was accepted as a strategy in 2002, but "The Circular Economy Promotion Law of the People's Republic of China" took effect in 2009 (Yuan et al., 2006; Lieder & Rashid 2016).

Lastly, this research points to the importance of looking across disciplines. For example, the humanities were an early adopter of research on Voluntary Simplicity and Collaborative Consumption. Focused more on society than business, these disciplines are more open to considering radically different types of economic institutions. Similarly, research in science and engineering can inform business academics of the likely technical challenges that business is encountering as they start to embrace ideas regarding the Circular Economy.

Conclusions

Business practitioners and academics may want to step back and do some self-reflection on why we have moved so slowly in this field of research. Car sharing, swap meets, and others forms of Collaborative Consumption have existed for years, even decades, yet business research on the Sharing Economy only really took off in 2015, and is primarily in management journals focused on environmental, ethical and social issues. Overall, as was shown in our quick count of Circular Economy activities, there was a strong bias in all the papers towards aspects of the Circular Economy that do not directly address consumerism, such as recycling and recover. The continued focus on EPR and PSS suggests that business researchers may have trouble moving from the traditional framing of the firm and economy, limiting the ability of researchers to envision the magnitude of change offered by the business models focused on reduction, reuse, and repair strategies (i.e., Voluntary Simplicity, Sharing Economy, and Collaborative Consumption).

Scholarship on the evolution of management thought may explain why the business field has lagged in the research on theory development and testing in some areas of the Circular Economy more than others. McKinley et al. (1999) suggests that theory detection and assimilation with the development of a legitimate school of thought needs emerging theory to be novel and also needs to have some aspect of continuity with existing scholarly knowledge. Only then is there an increased likelihood that the new theory is identified and assimilated into the field. This may help explain why we saw a larger uptake

of less radical aspects of the Circular Economy, such as EPR and PSS, earlier than more radical concepts such as Collaborative Consumption. Topics like industrial ecology, recycling, remanufacturing, etc., have some continuity with traditional operations research. Reducing consumption at the level of the consumer, on the other hand, is at odds with traditional business models. One exception to this would be in marketing, where the focus is on understanding consumer need. Thus, we see marketing take on some of these more ideas earlier than other areas.

Context is another important factor in the uptake of new theory. Ofori-Dankwa & Julian (2005, 1309) found that the quality of the publication outlet will all influence the extent to which a theory is "likely to be detected and assimilated by scholars, and also the extent to which there is an increase in theory development and empirical research based on that theory." To maximize assimilation of more radical models of sustainable business, scholars on the leading edge of these ideas should make a greater attempt to publish in what are considered top management journals. Simultaneously, top journals should also call for research to stimulate new theories and models related to low consumption and allow for an interdisciplinary approach that is needed to address our sustainability challenges, as noted by Nohria & Eccles (1998). Lastly, following the findings of Ofori-Dankwa & Julian (2005), researchers should try to partner with scholars in high reputation universities, a factor that also impacts levels of research and assimilation.

Another second aspect of context is the history of management theory. Boyacigiller & Adler (1991) point out that Europe and North America inhabit somewhat different intellectual communities; the more sociological orientation of European scholars may make it more likely that they would be influenced, and even contribute to, research in the humanities that looks at changes in societal norms around consumption. Additionally, given the dominance of American institutions in the development of management theory, many of the theories stem from a focus on the experience of American firms (Boyacigiller & Adler, 1991). Yet, in the case of the Circular Economy, the context in China and Europe is far different in terms of environmental challenges, social and political expectations, and options for waste management. While in the United States there has been little legislation pushing firms and society to engage in, or even think about, the Circular Economy, European and Asian countries have instituted government policies relating to the Circular Economy and have provided government funding to support this research. These countries are a window towards the future challenges for businesses in North America; it would be wise for scholars in the United States to partner with scholars in these and other countries.

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